



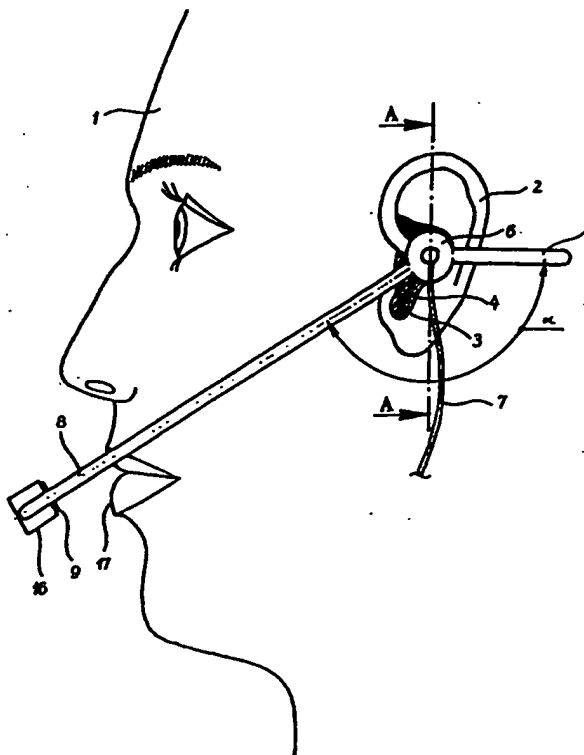
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification<sup>6</sup> : <b>H04M 1/05</b></p>	<p><b>A1</b></p>	<p>(11) International Publication Number: <b>WO 99/34576</b></p> <p>(43) International Publication Date: 8 July 1999 (08.07.99)</p>
<p>(21) International Application Number: PCT/HU97/00089</p> <p>(22) International Filing Date: 28 December 1997 (28.12.97)</p> <p>(71)(72) Applicants and Inventors: <b>HOLAKOVSKY, László</b> [HU/HU]; Alabástrom u. 11, H-1116 Budapest (HU). <b>NAGYKÁLNAY, Endre</b> [HU/HU]; Törökvész út 78/B, H-1025 Budapest (HU). <b>SZILÁGYI, András</b> [HU/HU]; Torbágy u. 14, H-1118 Budapest (HU).</p> <p>(74) Agent: <b>KOVÁRI, György</b>; Advopatent, Office of Patent Attorneys, Fő utca 19, H-1011 Budapest (HU).</p>		<p>(81) Designated States: AU, BR, CA, CN, JP, KR, NZ, RU, US, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</p> <p>Published <i>With international search report.</i></p>

(54) Title: HEADSET WITH MOUTHPIECE

## (57) Abstract

The headset, especially for use with a telephone apparatus or computer, includes two earphones (10, 13) connected with a microphone (9) by a flexible frame (8). The flexible frame (8) is U-shaped, the two earphones (10, 13) are fixed to each end of the frame, the microphone (9) is placed in the middle of the frame. When worn on the head, the earphones (10, 13) or the cases (6, 15) or the earphones protrude into the deeper middle part of the left and the right ear (2), respectively. The earphones (10, 13) are held in the ears (2) by the light pressing force of the U-shaped flexible frame (8). A counterweight-console (5, 14) projects backward, in relation to the face, from each earphone (10, 13) or case (6, 15).



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## HEADSET WITH MOUTHPIECE

The invention relates to a headset especially for telephone or computer, having two earphones connected to a microphone by a U-shaped flexible frame; the two earphones are fixed to each end of the frame, and the microphone is placed in the middle of the frame. When the headset is worn on the head, the cases of the earphones protrude into the deeper middle part of the left and the right ear, respectively, and the earphones are held in the ears by the light pressing force of the U-shaped flexible frame; and a counterweight-console projects backward (in relation to the face) from each case, thereby the centre of gravity of the device is under the ear, and the device is balanced on the head when the microphone is in front of the mouth.

A traditional telephone handset has an earpiece and a mouthpiece; in use, due to the curved shape of the handle, the earpiece can be applied to one of the ears while the mouthpiece is placed near the mouth. A major drawback of such a telephone handset results from the fact that one hand is engaged by holding the handset all the time during the call, unless the user presses the handset to the head with the

shoulder in a tiring position which cannot be endured for long. Another drawback is that the sound can be heard by one ear only, which results in a poor sound quality unsuitable for listening to music.

Both of said drawbacks are eliminated by the device "Supra Binaural" of the Plantronics Ltd., having two separate earphones connected together by a flexible band worn on the head; a microphone or a thin tube conducting the sound to the microphone curves from one of the earphones forward in front of the mouth. The drawbacks of this device are as follows: a.) it is not compact, the structure surrounds the head from above and partly from the front, and a cable hangs from each earphone toward the telephone apparatus; b.) the cushioned earphones overlying the auricles cover up the auditory canals, thereby preventing the user from hearing the outer sounds, i.e. the user is excessively isolated from the noises of the outside world; c.) the band on the head press down the hair, which can be unpleasant especially for women; and d.) the thin tube protruding in front of the mouth can easily get damaged or bent.

The device according to the US Patent No. 5099519 contains an earphone worn over one ear, and a microphone inserted into the other ear; the earphone and the microphone are connected by means of a band curving over the head. The

voice produced at the vocal cords and in the mouth is conducted through the throat, the facial cavities and the auditory canals to the microphone inserted into the ear. The disadvantage of this method is that the voice transmitted by the cavities is hollow and distorted, the head band may spoil the hairdressing, and the external sounds cannot be heard properly.

The device H 132 of the Plantronics Ltd. contains an earphone and a microphone with a console. The earphone is pressed into the deeper middle part of the auricle so that it can hold the tube with the microphone reaching toward the mouth without turning down because of the weight of said tube and microphone. It is an advantage of this device that it is easy and compact, however, there are disadvantages, too: 1.) the earphone pressed into the auricle causes a permanent uneasy, tensile sensation; 2.) if owing to the frequent calls the earphone is often pressed into the ear and removed, respectively, the ear may get abraded; 3.) the voice reaches one ear only; and 4.) the protruding tube with the microphone is short so that the weight of said tube and microphone cannot turn away the earphone pressed into the ear; consequently, the microphone doesn't reach the mouth, and the user should speak loudly.

It is therefore the object of this invention to provide a telephone headset with

mouthpiece, freeing the hands and eliminating the drawbacks described above, i.e. a.) the voice reaches both ears, resulting in a much better, more plastic, quasi-stereo sound quality as compared to the one-speaker headphones; b.) the earphone doesn't cover up the auditory canal, therefore the external sounds can be heard well during the call as well; c.) the device is compact, formed in one piece; d.) the earphones don't press the ear because of their sizes or as a result of the pressing force of the flexible frame; e.) there is no head band pressing down the hair; f.) during the use, the microphone is in front of the mouth, sensing the sound waves from the mouth clearly and directly; g.) the centre of gravity is placed so that the device will be in balance on the head even if the microphone is in front of the mouth; and h.) the device can be put simply, quickly and easily on the head.

The invention is based on three recognitions: 1.) the most simple geometric realization of a headset to hear with both ears is a U-shaped band passing from ear to ear in front of the mouth, said band having earphones at the ends and a microphone in the middle; 2.) due to the counterweight consoles reaching backward from the ears, the centre of gravity of the device is under the ears, and - seeing that the device is balanced - no pressing force should be exerted at the ears; 3.) if the

earphones and their cases have a diameter small enough, they can be introduced without forcing into the cavity in the middle of the auricle, and they orientate the position of the device as required.

The device according to the invention is realized essentially with a U-shaped flexible frame having an earphone (loudspeaker) at each end and a microphone in the middle; when worn on the head, the earphones or the cases of the earphones protrude into the deeper middle part of the auricle; and a counterweight-console projects from the earphone or case backward, behind the ear, on both sides.

In a preferred embodiment of the device, the U-shaped flexible frame is a tube containing the electric cables for the earphones and the microphone.

According to another characteristic of the invention, the counterweight-consoles are of high density so that they can balance with a short structural length (short lever) the weight and torque, respectively, of the elements placed on the other side of the earphones. It is expedient if the angle  $\alpha$  formed between the U-shaped flexible frame and the counterweight-consoles is  $140^{\circ} \pm 40^{\circ}$  in order that the counterweight may project far enough and exert the torque on a relatively long lever. Regarding that the weight of the cables connecting the device with the telephone or the

computer can unbalance the device, it is advantageous if the connecting cable is attached to the headset at one of the earphones or the cases containing the earphones.

A further preferred embodiment doesn't include any connecting cables (cordless construction). In this case, the device contains a power supply and an infrared or a radio frequency transmitter-receiver circuit, too. As the cordless embodiment allows the user to move away from the base equipment, the device is provided preferably with means for volume control.

The present invention will now be described by way of examples with reference to the accompanying drawings, in which:

Figure 1: a side elevational view of an embodiment of the device according to the invention, with the head of the user,

Figure 2: a cross-sectional elevation of the ear and the device according to Figure 1,

Figure 3: a longitudinal section of the device according to Figure 1 without the electric wires,

Figure 4: an electric circuit diagram of the device according to Figure 1,

Figure 5: a schematic arrangement of another embodiment of the device according to the invention, having an infrared transmitter-receiver, and



Figure 6: a schematic arrangement of a further embodiment of the device according to the invention, having a radio-frequency transmitter-receiver.

As shown in Figure 1, a case 6 containing an earphone is inserted into the cavity 3 (shaded in the drawing) of the ear 2 on the head 1; however, the case 6 doesn't cover the auditory canal 4. A microphone 9 is arranged in a case 16 in the middle part of a flexible frame 8, in front of the mouth 17. A counterweight-console 5 projects backward from the case 6, oppositely to the direction of the face.

According to Figure 2, the earphone 10 is placed at the inner end of the case 6 and is surrounded by a sponge cover 11 lightly pressed by the flexible frame 8 against the inner side (bottom) of the cavity 3 of the ear 2, and by the weight of the device against the lower part of the cavity 3. The diameter of the sponge cover 11 is smaller than the width of the cavity 3 of the ear 2, and therefore the sponge cover 11 can be inserted easily into the cavity 3, without forcing or stressing.

As shown in Figure 3, the flexible frame 8 is a tube made of e.g. a plastic material or light metal. The counterweight-console 5 is made - fully or partly - of a high density material, e.g. iron.

If the angle formed between the counterweight-console 5 and the flexible frame 8 is an obtuse angle, the centre of gravity of the device is under the ear 2 (Figure 1). When balanced, the microphone 9 is in front of the mouth 17; if the microphone 9 is deflected from its balanced position (e.g. lowered below the chin), it returns near the mouth. Minor deflections without return are allowed by the frictional braking effect of the sponge cover 11. If the counterweight-console 5 is formed as a rectilinear continuation of the flexible frame 8, i.e. the angle between the console and the frame is  $180^\circ$ , the centre of gravity and the centre of the earphone 10 (and 13, respectively) coincide, and the device is in balance independently from the position of the microphone 9 or the head 1 (lowered or lifted up). It should be noted that the flexible frame and the counterweight-consoles can be shaped differently from the embodiments shown in the drawings; they can have e.g. a thickening/tapering or bent shape, too.

The electric system of the device according to Figure 1 is shown schematically in Figure 4. As illustrated, the earphones 10, 13 are connected parallel to each other and, as usual, the same sound is transmitted to both ears 2. If a stereo sound should be transmitted, separate sound signals are given to the left earphone 10 and the right earphone

13, respectively. The microphone 9 is always connected by a separate pair of wires. The device is connected electrically to the telephone apparatus or computer 18 generating and matching ohmically the sound signals for the earphones 10 and 13, and receiving and amplifying the sound signals from the microphone 9 of the device. The connecting cable 7 is attached to the device preferably at the left case 6 or the right case 15 near the gravitational line passing through the centre of gravity.

In another embodiment, the device has no connecting cable (cordless construction).

In the embodiment shown in Figure 5, the sound signals are transmitted by infrared radiation; the electric system of the device contains an amplifier 19, an infrared source 20 (e.g. LED) for transmitting the sound signals of the microphone, an infrared sensor 21 (e.g. photodiode) for receiving the sound signals from the telephone apparatus or computer 18, a power supply 22, two earphones 10 and 13, and a microphone 9. Preferably, a rechargeable battery (of pencil-like shape) is used as power supply 22 placed into the hollow counterweight-console 5 on one side; the other hollow counterweight-console 14 contains the amplifier 19 and a balance weight 23 at the end of the console; the infrared source 20 and the infrared sensor 21 are built into the case 6 of

one of the headphones. The telephone apparatus or computer 18 connected to the device also contains an infrared source, an infrared sensor and an amplifier. When using a transmitter-receiver of low power, the associated pairs of infrared sources and sensors must "see" each other well, which can be achieved easily e.g. at a desk or in a car.

In the embodiment according to Figure 6, the sound signals are transmitted by radio frequency radiation; in this case, the device contains an amplifier 19, a demodulator circuit 24, a transmitting aerial 25, a receiver circuit 26, a receiving aerial 27, a power supply 22, two earphones 10 and 13, and a microphone 9. The telephone apparatus or computer 18 connected to the device also contains a radio frequency transmitter-receiver.

The device according to the invention can be used in many fields because of its light weight, quasi-stereo or stereo sound quality, which is much better than that of the one-speaker devices; it can be worn comfortably while the hands remain free. It can be used e.g. as a headset for telephone at home or in the office freeing the user from holding a usual telephone handset; therefore the user can continue his work or other activity during the call. Very advantageously, the device - especially the cordless embodiment - can be

connected to mobile phones used in cars to prevent accidents by letting both hands of the driver free. The device according to the invention is more advantageous than other devices with headset or external speaker-microphone when computer multimedia programs are used with a sound card and voice synthesizer, and when a call is made by means of a computer via Internet. The possibility of the stereo sound can be utilized, too. In principle, the device can be connected to any audio or audio-visual equipment and used as a headphone.

## Claims:

1. Headset for telephone, having two earphones connected with a microphone by a flexible frame, characterized in that the flexible frame (8) is U-shaped, the two earphones (10, 13) are fixed to each end of the frame, the microphone (9) is placed in the middle of the frame; when worn on the head, the earphones (10, 13) or the cases (6, 15) of the earphones protrude into the deeper middle part of the left and the right ear (2), respectively; and a counterweight-console (5, 14) projects backward, in relation to the face, from each earphone (10, 13) or case (6, 15).

2. Headset according to claim 1, characterized in that the diameter of the part of the earphones (10, 13) or the cases (6, 15) of the earphones, protruding into the ear, is smaller than 16 mm.

3. Headset according to claim 1 or 2, characterized in that the weight of the counterweight-consoles (5, 14), in relation to their volume, is higher than that of the elements directed from the earphones (10, 13) toward the face.

4. Headset according to any one of claims 1 to 3, characterized in that the angle ( $\alpha$ ) formed between the U-shaped flexible frame (8) and the counterweight-consoles (5, 14) is  $140^{\circ} \pm 40^{\circ}$ .
5. Headset according to any one of claims 1 to 4, characterized in that the cable (7) connecting the headset to a telephone apparatus or computer (18) is attached to the headset at the left or right earphone (10, 13) or case (6, 15).
6. Headset according to any one of claims 1 to 5, characterized in that the headset comprises an infrared source (20), an infrared sensor (21), an amplifier (19) and a power supply (22).
7. Headset according to any one of claims 1 to 5, characterized in that the headset comprises a radio frequency receiver circuit (26), a receiving aerial (27), a demodulator circuit (24) and a transmitting aerial (25).
8. Headset according to any one of claims 1 to 7, characterized in that the power supply (22) is a rechargeable battery of pencil-like shape placed into one of the counterweight-consoles (5 or 14).

9. Headset according to claim 8,  
c h a r a c t e r i z e d in that the headset  
comprises a connector for recharging.

10. Headset according to any one of claims 1 to  
9, c h a r a c t e r i z e d in that the  
headset comprises means for volume control.



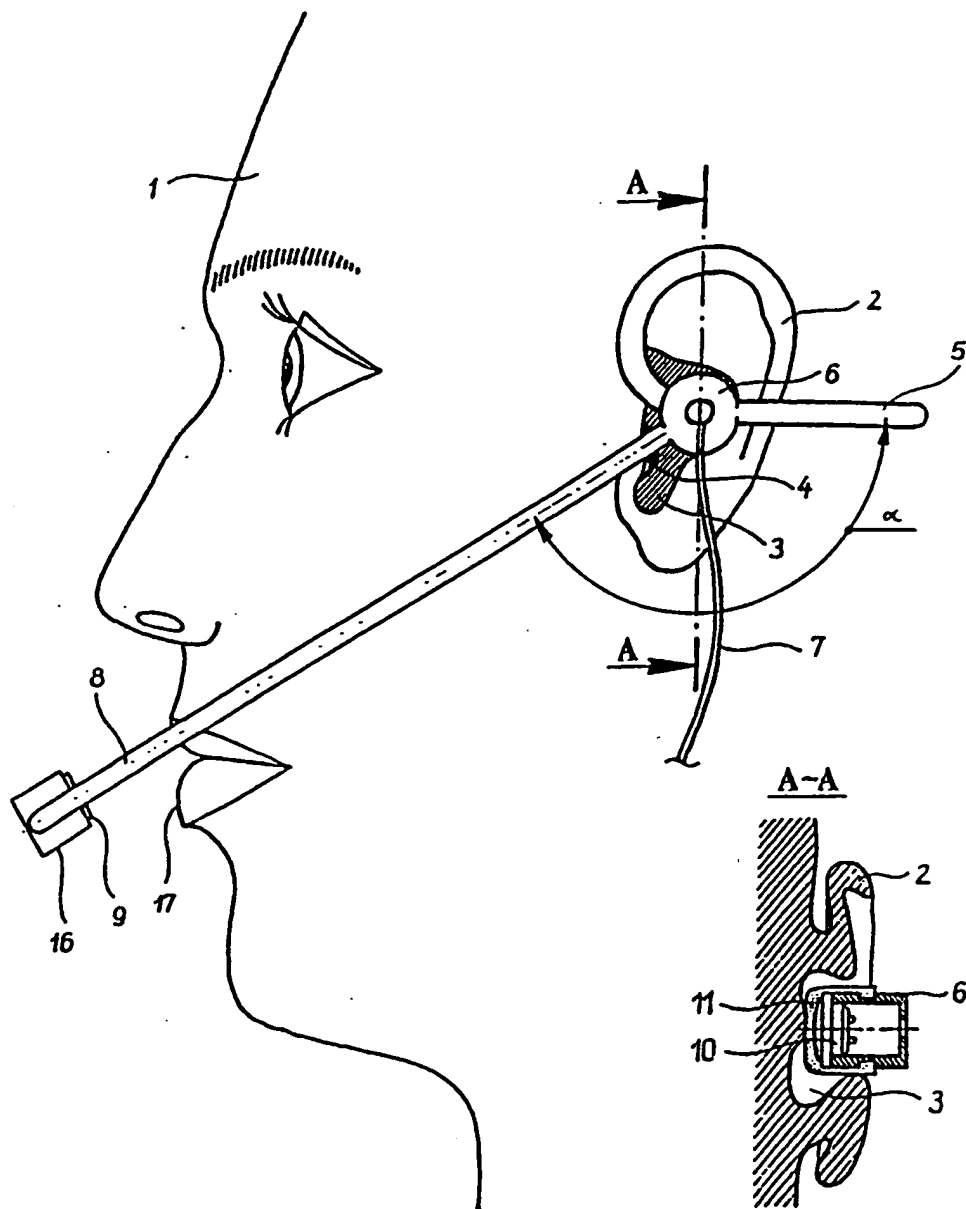


FIG.1.

FIG.2.

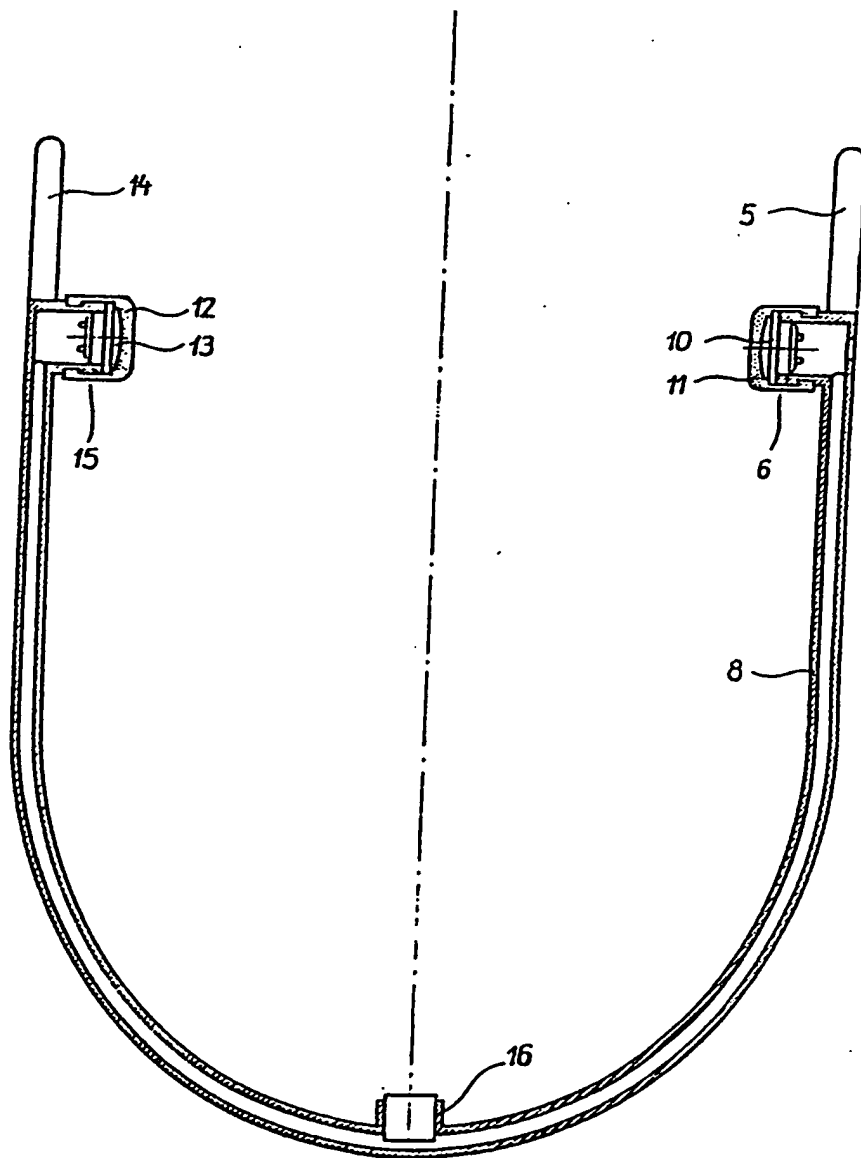


FIG.3.

3 / 4

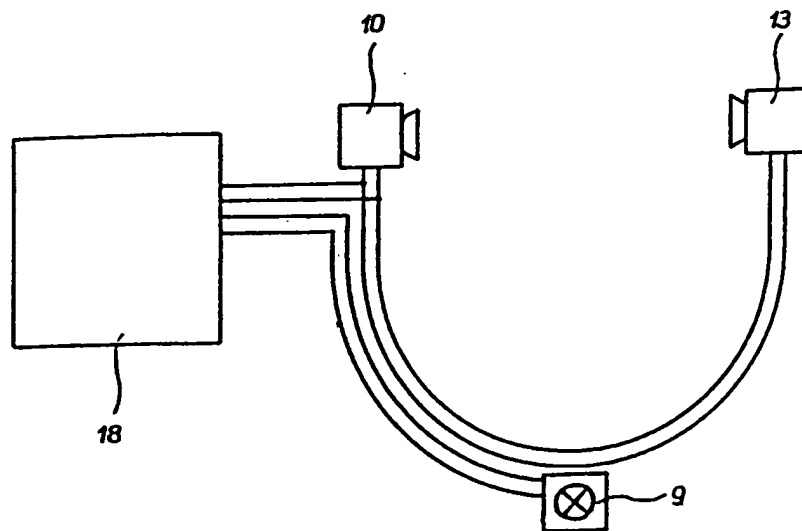


FIG. 4.

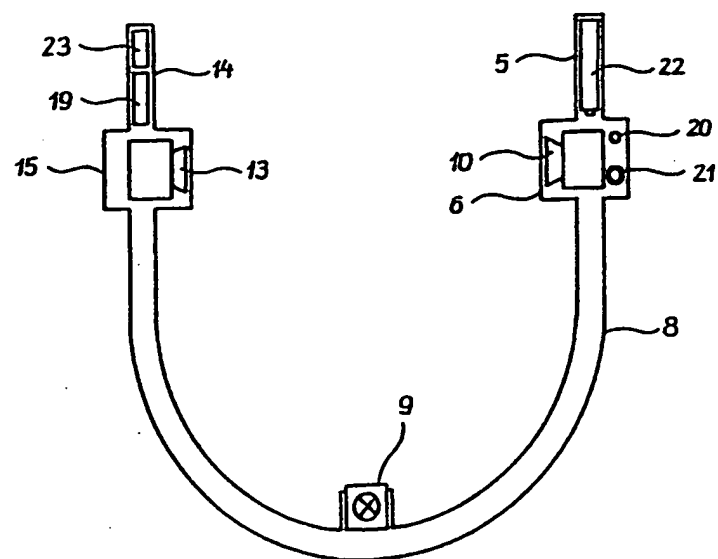


FIG. 5.

4 / 4

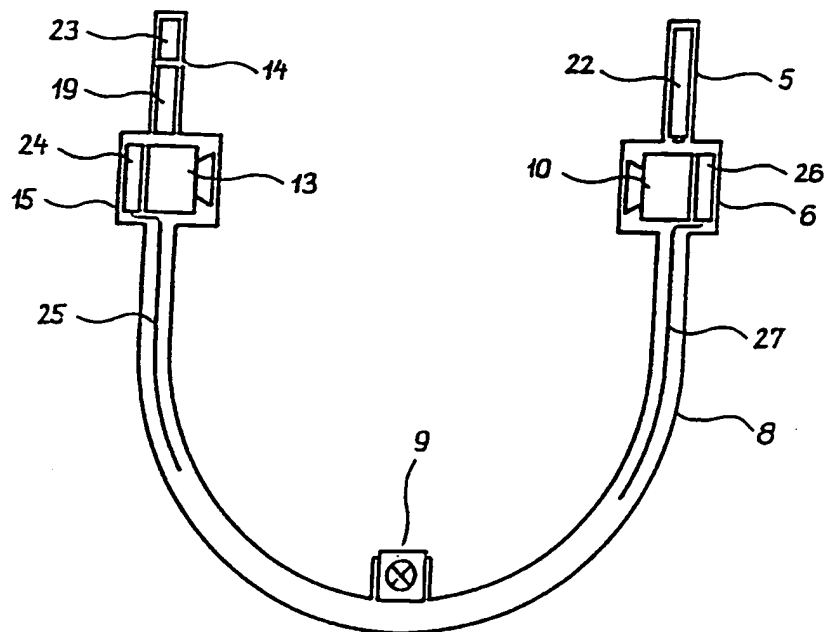


FIG. 6.

# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/HU 97/00089

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 6 H04M1/05

According to International Patent Classification(IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
IPC 6 H04R H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 95 15044 A (ULLMAN JOHAN) 1 June 1995  see page 1, line 32 - page 2, line 30 see page 6, line 18 - page 9, line 20; figures 1-4	1,3,5, 7-9
A	US 4 993 065 A (CHIOU OLIVER C) 12 February 1991 see column 1, line 55 - column 2, line 2; figure 3	1
A	FR 1 556 332 A (BERSAC J.A.) 7 February 1969 see the whole document	1
A	FR 1 467 139 A (SOCAPEX) 12 April 1967 see the whole document	1

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

5 August 1998

Date of mailing of the international search report

12/08/1998

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NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
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Authorized officer

Golzio, D

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/HU 97/00089

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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